ring within fifteen months in the practice of a phthisical midwife, who was in the habit of sucking the mucous from the mouths of the new-born infants, and of blowing air into their lungs. Pigs fed upon the milk of tuberculous cows became tubercular in five weeks.

(*c*) By inhalation. Animals after a few inhalations of tubercular sputum, disseminated in a spray, readily became infected. Koch holds that no other substances than tubercular products when introduced into an animal will produce tuberculosis.

The *résumé* of the changes which take place in the blood in various diseases is most complete and up to date. The latter part of the book deals with the diseases of the circulatory organs.

Among alterations which are desirable in a new edition we would suggest that the forms for the *post-mortem* reports which occupy four pages should be omitted; or, if not, they should be made much more complete. Many important headings, such as lymphatic glands, joints, prostate, &c., are wanting. Fig. 25 is an unfortunate illustration of lardaceous disease of the liver in which the liver cells are affected, and should be replaced by a more typical case with healthy cells. We would demur to the statements that lymphadenoma produces great anæmia and infiltrates tissues—that is, in the sense in which sarcoma is said to infiltrate. The growths extend only along lymph-channels, and do not infiltrate outside these. On p. 82, sulphide of potassium should be sulphite.

We congratulate the author on the general excellence and practical nature of his book, and shall await with interest the second volume. The arrangement of the type, the paper, and the illustrations are unexceptionable, and reflect the greatest credit upon all concerned.

OUR BOOK SHELF.

A Graduated Course of Natural Science. Part I. By Benjamin Loewy, F.R.A.S. (London: Macmillan and Co., 1889.)

THIS is an admirable little book which has been prepared for the use of teachers and students in schools where elementary ideas of physics and chemistry form part of the course of training. It is intended for elementary students only, and it is not too much to say that the various experiments and inferences are well within the scope of every boy and girl of ordinary ability. It is but to be expected that during his twenty years' experience the author has become thoroughly acquainted with the difficulties met with by young students, and with the best methods of overcoming them.

An experiment is first described, and the inferences to be drawn are then discussed, the simple conversational style being especially suitable for young pupils. The subjects are arranged in a very natural order, and it would be difficult to suggest improvements. Very practical suggestions are made as to the best way of arranging for each student to perform the experiments. A simple board, about 3 feet long by 18 inches wide, temporarily screwed to the top of the desk, has been found sufficient to accommodate two or three pupils, so that it is an easy matter to have thirty or forty working at the same time. To make the book more useful to teachers, a series of questions has been put at the end of each chapter.

We strongly recommend the book to the notice of teachers likely to be interested in the subjects of which it treats.

Flora of Switzerland for the use of Tourists and Field-Botanists. By A. Gremli. Translated from the Fifth Edition, by Leonard W. Paitson. (London: David Nutt, 1889.)

ENGLISH visitors to Switzerland who happen to be interested in botany must often have regretted that they did not possess a really good hand-book of the Swiss flora. The translator of Herr Gremli's well-known work has provided a volume which will exactly meet their wishes. The original book has been widely circulated in Germany, and its materials are so ample, and so carefully and intelligently arranged, that it well deserves its popularity. In the fifth edition many improvements were made, and these are, of course, embodied in the present rendering. Mr. Paitson has also been able to include the new matter presented in the French translation by M. J. J. Vetter (1885), and corrections and additions published (1887) in the latest—the fourth—of Herr Gremli's supplements. Although the work is intended in the first place for persons beginning the study of botany, it contains much information with regard to new species that will be of service to more advanced botanists. We may note that the English volume is clearly printed, and that it is of a size convenient for the use of tourists.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Coral Reefs.

I AM obliged to Mr. Murray and Dr. Guppy for their courteous replies to my questions. Mr. Murray knows how pleasant a duty it is on the part of Admiralty surveyors to collect materials for the investigation of men of science like himself. Perhaps he will allow me to say that the theory of wave action spreading out the loose materials of a volcanic island is difficult to understand in view of the fact that islands in the same locality, such for instance as Mokongai and Wakaya in the Fiji Group, have their barriers far away from the land on exactly opposite sides. If he will excuse repetition, I desire again to point to the Exploring Isles, and to the great distance between the barrier and the island of Vanua Mbalavu; also to the fact that the waves, for all but a few days in the year, attack the island from a direction varying between south-south-east and east-north-east, principally east-south-east. Although there is much upraised coral at the north end of Vanua Mbalavu, the formation is chiefly volcanic.

The shallow nature of the Na Solo lagoon is, I presume, due to the detritus from the now sunken island, and the fragments from the reef washed over by the heavy seas at high tide. The bank west of Ono, in the Kandavu Group, is terminated by a sunken barrier, similar to that south of Viwa and north-west of Mbengha; and is not a continuous reef awash, because of the muddy streams from Ono sweeping to leeward, and also for the reason, admitted on all sides, that coral does not grow with so much vigour where there is no surf.

Dr. Guppy's simile, of an engineer having constructed and afterwards repaired a bridge, is not, in my opinion, a good one. A bridge is a structure accomplished on mathematical principles, good or bad. If good, it will stand; if bad, it will sooner or later fall. Mr. Darwin's theory, like other theories, is not capable of mathematical proof; and it is deduced from personal observation only in a very limited degree. The second edition of his work indicates, that after thirty-two years' further experience in weighing, deducing, and generalizing of a similar character in other branches of natural history, and receiving the views of those opposed to his theory on this special subject, he still adheres to his original opinion. The principle of his work was, in all cases, very much the same; and, considering the labour which he devoted to the first study of the question several years after he returned from his voyage, it is hardly conceivable that the origin and formation of coral reefs did not occupy a

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considerable share of his attention in the long interval between the publication of the first and second editions of his book. As to acquaintance with the objects of his writings, he had none, I presume, with that horrid creature with the swim-bladder from which he believed we are all descended; nor with most of the animals which have formed the connecting links between that distinguished progenitor and man; but, nevertheless, his great collection of facts and evidences have been of sufficient weight to revolutionize the history of creation, and to pervert hundreds of thousands from their faith in the poetical narrative of Moses.

However, Dr. Guppy is correct in saying that there are certain upraised ancient reefs in the Lau group of Fiji. Lieut. Malan was no doubt alluding to the islands of Tavuthá, Naiau, and Kambara, which have every appearance of atolls lifted out of the sea, for they are coral islands of considerable height, with an exterior rim and depression in the centre, between 150 and 200 feet deep. It does not follow that they may not form *now* part of a descending area; nor that the Bukatatanoa and Reid Reefs may not be participating in the movement. It is remarkable that only one reef has yet been discovered which connects the atoll awash with the island many hundreds of feet high which has been, to all appearance, an atoll in past ages. As far as I am aware, there is no island known, except Aldabra (which has a lagoon dry at low water, and is, therefore, an abnormal instance), of coral formation, with a lake in the centre and openings on the lee side; in such a stage as an atoll would be if it was elevated, say, 20 or 30 feet; nor do I believe that anyone has yet seen an upraised island *barrier* reef. The sight would be so phenomenal, that the news of its existence would speedily become public property. It must be remembered that, while proofs of upheaval are easily detected, direct *evidence* even, of subsidence, is most difficult to obtain. All searching under water is groping in the dark.

I may here remark, as it is our common object to arrive at the truth, and surveyors are not special pleaders, that there is an error in Mr. Dana's examples of subsidence (p. 310, "Coral Reefs," Darwin, third edition). Nanuku Islets are cays on a spur from a barrier reef, and Bacon Islets are formed of coral. It is unfortunate that these should have been inadvertently taken as types so late as 1885, three years after the charts were published, though it is easy to understand how Mr. Dana was mistaken in his first book when he had to rely simply on the excellent sketch made by the officers of Wilkes's expedition, to which he was attached; but these mistakes do not necessarily invalidate the conclusions of the experienced naturalist, who, had he thought of it, could have selected other and better examples from the same group.

It would be premature to discuss the cases of the Tizard and Macclesfield banks before Dr. Bassett-Smith records the results of his examination of the specimens collected, in pursuance of Captain Wharton's directions, chiefly by himself and Lieut. Parry, of the *Rambler*; but this much may be said—the existence of a submarine cliff is established in the former, and the sectional slopes have a great resemblance to those of mountains. The condition of the Itu Aba and its surrounding reef appears to favour Mr. Murray's views; but the general state of the reef does not, as far as I can see, disprove the theory of subsidence. The one Macclesfield bank section is not at all like that of a sinking mountain; and the condition of the coral on the top might indicate either a downward or upward movement, or neither. If we find, as in both these cases, a mixture of dead and live coral on the rim of an atoll, the inference seems more in favour of subsidence than elevation. It implies that a sudden descent to a depth beyond that in which the less hardy individuals of the species can flourish, has killed the growing insect; and that a new effort is being made to regain the surface. Specimens of reef-building corals were brought up from depths below even 30 fathoms; but, as far as the imperfect appliances which we have at present could help us, there was no evidence that *masses* of coral were at all common below 13 fathoms. The condition of the slopes could be safely compared to the banks of a river stream with the blades of grass growing thinner and thinner as the distance from the water was increased (Darwin, p. 111).

In the case of the Bukatatanoa, and other large reefs of a similar character, my difficulty with respect to Mr. Murray's theory is this: if corals commenced to grow on sediment which had lodged on a submarine inequality, why should nearly all parts have kept pace so evenly in their growth? The highest portion of the bank on which the Bukatatanoa Reef—according to the theory of Mr. Murray—rests, would surely not be around the sides, but somewhere in the centre. There would be a summit of some kind, to which the sediment would be first attracted. Is it not most improbable that first the pelagic organisms which are dead, and then the coral polyps which are alive, should maintain an even contour around three sides of a bank and many miles away from the highest part of it, and arrive at the surface of the ocean much about the same time? If it is said, How do you know it arrived at the surface at the same time? I point to the connected form of the barrier. According to Mr. Murray, had it not done so, it would have formed innumerable rings instead of being connected, without a break, for so many miles.

Reid Reef, to the north of Bukatatanoa, is a still more remarkable instance. Here, there is a feature, which Mr. Murray mentions, quite apparent, viz. the paucity of coral heads in a lagoon where the barrier is uninterrupted; but the difficulties which I have ventured to place before him are greater than ever: (1) Why should wave-action distribute a bank on the weather as well as the lee side of the land? (2) Why should the insect reach the surface simultaneously on all sides, as shown by the continuous reef and the uniformity of its breadth? To the best of my recollection, the islets within this barrier are of volcanic origin, but the point is not material.

With reference to Mr. Murray's explanation of the deficiency of reef under Mbuke Levu (Mount Washington), may I point out that it is of great assistance in showing why, when discussing subsidence, it is not necessary to hesitate for examples at those islands which have a barrier on one side and a fringe on the other. On a cliffy, steep side, the sinking fringe would, of course, remain very close to the new coast-line, and, if it assumed the barrier form at all, would rapidly become filled with pieces from the land.

The fragmentary character of the Great Barrier Reef of Australia does not seem to have excited the attention it deserves in this controversy. I believe that there are innumerable passages through it, and that, instead of being termed a "barrier," it might better be described as a collection of large patches.

W. USBORNE MOORE.

8 Western Parade, Southsea, July 9.

The Hailstorm in Liverpool.

Sunday, June 2.—A very sultry afternoon, with heavy thunder-clouds in the south-west and west, and continual rumblings from the same direction, the storm evidently passing over the Dingle and Toxteth Park. Soon after 3.30 p.m. lightning became visible and the storm broke.

At first a few large drops of rain fell, making patches of 1½ to 2 inches in diameter on the cement. In a minute or two, large lumps of ice came slowly down, rebounding to an astonishing height. As the stones became more numerous they decreased considerably in size and fell with greater force. This lasted for ten or twelve minutes. The rain had nearly ceased during the height of the storm, but began again towards the end for a short time. I immediately collected some stones off the grass, and placed them in a dish on some blotting-paper.

They were evidently of two classes; the one having clear ice kernels, the other white misty ice. If the stone was large the kernel was surrounded with another coating of the opposite kind of ice, a dark line intervening between the two, and here and there I noticed a third or fourth layer.

Many in themselves spherical had a pear-shaped appendage, which, however, soon melted away. One or two (Fig. 4) had the second layer thinner than the others, making a hollow between the centre and exterior layer, both above and below.

I found one of a most curious construction (Fig. 3). The stone was all composed of white ice except at one end. The white ice seemed to terminate like the petals of a flower, closing in round a centre of clear ice. This construction was entirely formed below the surface, the stone being otherwise smooth. I could not take accurate measurements owing to the absence of a correct scale, but approximately the stones I drew measured as follows:—

	Breadth.	Width.	Thickness.
(1)	$\frac{12}{16}''$	1″	$\frac{8}{16}''$
(2)	spherical, about	$\frac{10}{16}''$	
(3)	$\frac{15}{16}''$	$1\frac{3}{16}''$	$\frac{14}{16}''$
(4)	$\frac{14}{16}''$	$1\frac{4}{16}''$	
(5)	$\frac{14}{16}''$	$1\frac{5}{16}''$	$\frac{10}{16}''$

The stones had all a metallic taste and also a flavour of ozone.

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